



Sandford Fleeming, Esq.

in no 2501

WASELL'S

RAIL TRUSSES

FOR

BRIDGES AND ROOFS

AND

IMPROVED TRUSSED GIRDER BRIDGE.

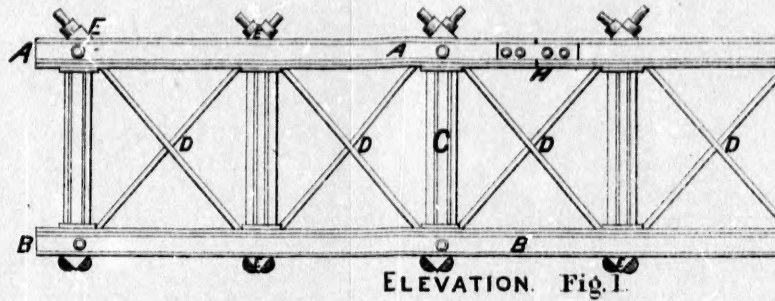
LONDON, ONTARIO, CANADA:

1875.

Reference
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WASELI'S RAIL TRUSSE

Patented 9th Feb^y 1875.



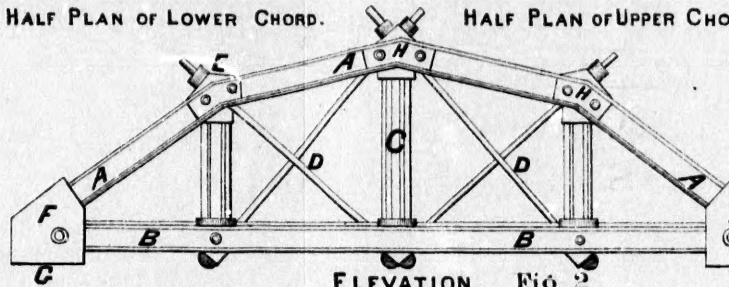
ELEVATION. Fig. 1.



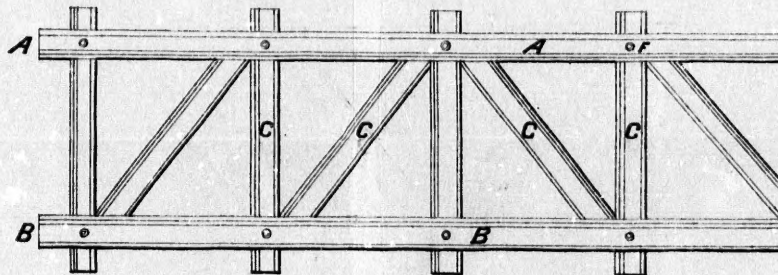
HALF PLAN OF LOWER CHORD.



HALF PLAN OF UPPER CHORD.



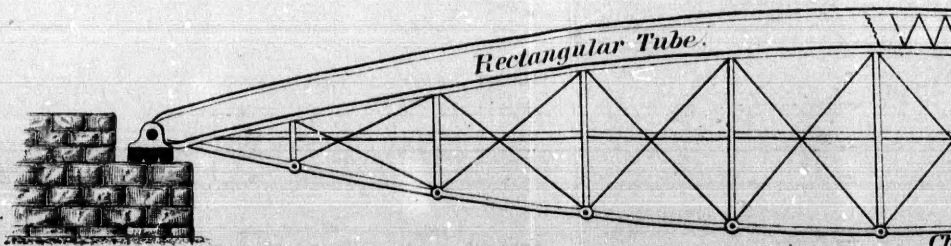
ELEVATION. Fig. 2.



ELEVATION. Fig. 3.

IMPROVED TRUSSED

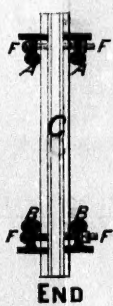
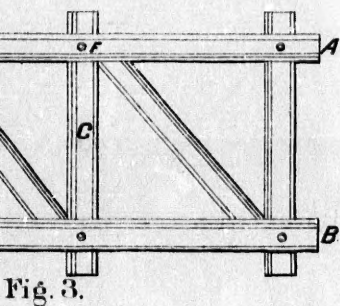
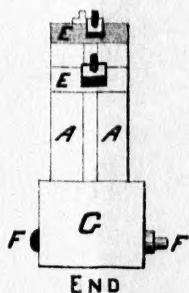
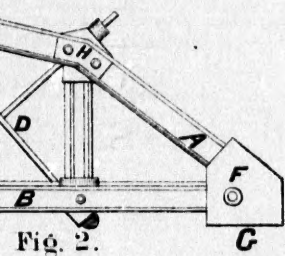
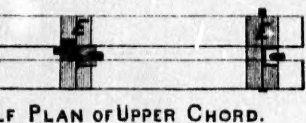
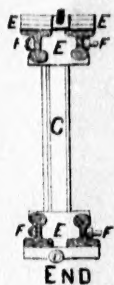
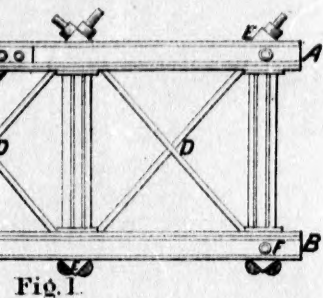
Patented 15th Oct^r



ELEVATION OF SIDE

TRUSSES.

Feb^y 1875.

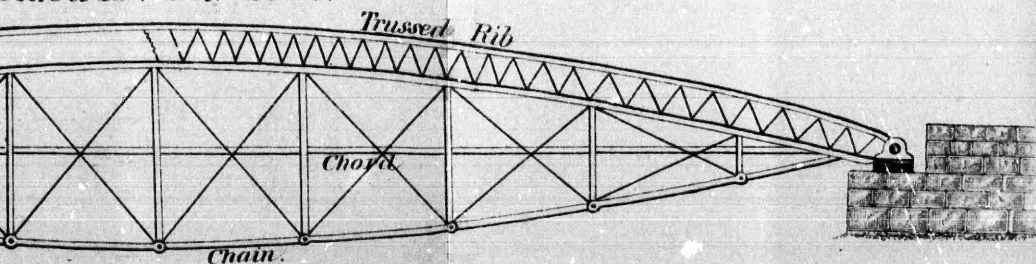


REFERENCE.

- A* Upper Chord.
- B* Lower Chord.
- C* Post or Brace.
- D* Tie-rod.
- E* Casting.
- F* Bolt.
- G* Shoe.
- H* Fish-joint.

TRUSSED GIRDER BRIDGE.

Patented 15th Oct^r 1874.



ELEVATION OF SIDE TRUSS. Fig. 4.

WASELL'S
Patent



See no 25017

WASELL'S

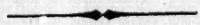
RAIL TRUSSES

FOR

BRIDGES AND ROOFS

AND

IMPROVED TRUSSED GIRDER BRIDGE.



LONDON, ONTARIO, CANADA:
1875.

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PAUL T. R. B.

BEDDERS AND

REPRODUCED THE

WASELL'S RAIL TRUSSES.

LONDON, ONTARIO, CANADA.

GENTLEMEN :

I have the honour to bring to your notice my "Rail Trusses" for Bridges and Roofs, patented for the Dominion of Canada, 9th February, 1875.

It has long been considered desirable that our railway and road bridges should be built of iron instead of wood, but the item of first cost has prevented the adoption of iron to any large extent in their construction. My "Rail Trusses," adapted to bridges, puts within our reach the means whereby iron bridges can be built as cheaply as wooden ones ; and in the neighbourhood of railways, where old rails can be conveniently got, the cost will be less. When the durability is considered, these "Rail Trusses" must commend themselves to all railway, road and municipal corporations who may need to build new bridges or restore the old ones.

The Committee of Investigation of the G. W. Ry. of Canada, in 1874, reports that there are "18,000 tons of old rails lying rusting alongside their track," (pp. 7 and 25 of Report,) and judging that other railways are similarly situated in this respect, I would draw your attention to the immense amount of material, otherwise almost useless, that is now available for your use ; and that as long as rails are subject to be worn out by the locomotive the supply will continue.

I would also draw your attention to a bridge of a very superior description, my "Improved Trussed Girder Bridge," patented 15th October, 1874, and illustrated by figure 4 of accompanying drawings.

General descriptions and drawings are herewith attached, so that engineers of railways, counties, and the different municipalities, and all mechanics may erect my "Rail Trusses," at pleasure, by first purchasing the right to do so from me.

Detailed descriptions, plans, working drawings, &c., with the strains marked upon the various members of any of these Trusses, adapted to bridges of any span, can be got from me at very moderate charges.

As my object in designing those "Rail Trusses" has been to use up a large quantity of otherwise nearly useless material, combined with the greatest simplicity of construction, putting within the reach of all the means of erecting good, substantial iron bridges without the aid of skilled labour where it is difficult to obtain. And believing that the Dominion Government has granted these patents to me, as much in the interests of the various classes concerned as for my own benefit, I trust that any infringement of my patents will be reported to me, and the party or parties so doing will receive one half of the damages that may be recovered in an action at law for the said infringement, up to the amount of two hundred dollars, as a reward for their trouble.

I am, Gentlemen,

Yours very faithfully,

EDWARD WASELL.

WASELL'S RAIL TRUSSES.

PATENTED 9th FEBRUARY, 1875.

DESCRIPTION, &c.

OBJECT OF THE INVENTION.

The object of the invention is to apply the common iron or steel rails in use upon, and forming part of, the superstructure or tract of railways, and also utilizing the worn-out rails now *lying rusting* in thousands of tons along the sides of railways, in such a manner that strong, durable and efficient trusses for bridges and roofs may be built therefrom.

RAILWAY AND ROAD BRIDGES.

When these Trusses are used for bridges, the iron work must be so proportioned that the greatest rolling or travelling loads, in addition to the weight of the structures themselves, must not strain the iron rails more than 7,000 lbs., nor the steel rails more than 10,000 lbs. of tensile or shearing strain. The bolts and tension rods may be strained to 10,000 lbs. per square inch of tensile, and 7,500 lbs. of shearing strain, and all compressive strains must be in proportion to the ratio of the length to diameter, or least radius of gyration, as by Mr. Lewis Gordon's formula, deduced from Mr. Hodgkinson's experiments. (See pp. 237, 522 and 523, Rankine's Civil Engineering.)

USE OF OLD RAILS.

All compression members, such as the upper chords or booms, posts and struts, may be built entirely of old rails; as, what is termed the "crystallization of wrought iron," which goes on where iron is subject to repeated vibrations or concussions, such as the rails under the wheels of a locomotive, does not impair the resisting power of the metal, in any great degree, to compression.

Where these Trusses are used for railway bridges, the lower chords or booms ought always to be built of new iron or steel rails.

CASTINGS, &c.

The castings form an essential part of these "Rail Trusses." They must be of such a shape as to give an even bearing to the posts, struts and washers of the tie-rods, as well as to bind the different rails, forming the chords or booms together, both vertically and transversely.

LENGTH OF SPAN, &c.

All bridges for railways, up to one hundred feet span, and for public roads up to one hundred and fifty feet span, may have both chords of iron or steel rails. For longer spans the lower chords should be of die-forged links with pin connections, and the upper chords and posts of steel rails.

TRESTLES.

Where trestlework is used for carrying the railway across shallow streams or low marshy ground, a foundation of hard burnt bricks or stones will be necessary upon which to rest the cast iron shoes or sockets into which the posts, formed of one or many rails, may fit, which posts will form piers upon which to rest the Trusses carrying the railway, &c.

ROOFS.

Where these "Rail Trusses" are used for roofs of large freight houses or barns, and similar buildings, a modification of the "King" or "Queen Post Trusses" will be suitable, the tie-beam being composed of rails joined by the common fish joint, &c.

JOINTS.

The joints, especially those in the lower chords or booms, form a very essential part of these "Rail Trusses." The necessary amount of *bearing area* of the bolts upon the stems of the rails can be attained by sufficient length of fish-plate, so as to allow of the necessary number of holes being drilled for a number of bolts whose diameters multiplied by the thickness of the stem of the rail shall give, in the aggregate, sufficient bearing area.

EDWARD WASELL, C. E.

LONDON, ONTARIO.



TABLE

*Showing comparative cost of "Wasell's Rail Trusses," adapted to
Bridges for Railways and Roads, with equally strong wooden
"Howe Truss Bridges" of the same span.*

The following estimate has been made at the undermentioned prices, including both Labour and Materials, viz: New iron rails at \$50 per ton, old iron rails at \$25 per ton, wrought iron for bolts and tension rods at 7 cents per lb., cast iron at 5 cents per lb., timber at \$30 per thousand F. B. M., including erection, &c., complete.

FOR RAILWAYS.

SPAN.	ESTIMATED COST OF WASELL'S RAIL TRUSSED BRIDGES.	ESTIMATED COST OF EQUALLY STRONG WOODEN HOWE TRUSS BRIDGES.	REMARKS.
	\$ c.	\$ c.	
30 feet.	310 00	400 00	Maximum load not to strain tension rods more than 10,000 lbs. per square inch of net section, nor iron rails more than 7,000 lbs. ditto.
50 "	650 00	900 00	
75 "	1,320 00	1,650 00	
100 "	2,410 00	2,800 00	
125 "	3,950 00	4,150 00	

FOR PUBLIC ROADS OF COMMON TRAVEL.

SPAN.	ESTIMATED COST OF WASELL'S RAIL TRUSSED BRIDGES.	ESTIMATED COST OF EQUALLY STRONG WOODEN HOWE TRUSS BRIDGES.	REMARKS.
	\$ c.	\$ c.	
30 feet.	280 00	350 00	Timber not to be strained more than 800 lbs. per square inch of net section. All compression members to be strained in proportion to the ratio of the length to diameter.
50 "	550 00	800 00	
75 "	1,050 00	1,300 00	
100 "	1,800 00	2,200 00	
125 "	2,500 00	3,000 00	

NOTE.—The prices at which the materials for the above estimate have been taken are given to enable any one to compute the cost of these bridges in his own locality, by adding or subtracting the per centage of difference.

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IMPROVED TRUSSED GIRDER BRIDGE.

PATENTED 15th OCTOBER, 1874.

By EDWARD WASELL, C. E.

SEE ILLUSTRATION OF SIDE TRUSS IN FIG. 4.

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FIGURE OF THE BRIDGE, &c.

The figure of the bridge, as seen in elevation, is a combination of the direct and inverted catenary, with a chord dividing the two arcs, so that the horizontal thrust of one is equal to the horizontal tension of the other.

IMPROVEMENTS, &c.

1st. The combination of rectangular arched tubes, or trussed curved ribs, with suspension chains.

2nd. The equilibrium of the forces or strains resulting from or caused by the arches, chords and chains being hinged to a large cylindrical pin, running through a truck upon rollers standing upon either pier.

ARCHES.

The arches forming the upper chords of the bridge to be rectangular in section, (the rectangular form being stronger than any other, as shewn by Hodgkinson's and Fairbairn's experiments,) and built of rolled plates or rails, as bent girders or curved ribs. The chords of

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the curved ribs to be connected together by zigzag or triangulated bracing, or by thin plates in the intervening space, and bolted or rivetted together so that the whole frame of each arch shell act as one piece, and possess sufficient stiffness in itself to enable it to maintain its form under a passing load.

CHAINS, CHORDS, &c.

The chains forming the lower chords of the bridge to consist of flat links connected together by the common eye-bar and pin-joints, (wire cables may be used where convenient.) The chords dividing the two arcs to possess sufficient strength and stiffness to enable them to carry the rolling load, and assist the chains in resisting the thrust of the arches.

SHEARING PINS, TRUCKS, &c.

The arches, chains and chords to be hinged to a large cylindrical pin running through eyes made in a truck upon rollers standing upon either pier, so as to give flexibility to the bridge and evenly distribute the strains and concussions arising from rolling loads or from fluctuations in temperature, and also to cause either chord of the bent girders or curved ribs to bear its due proportion of strain; because an arch with both cords of the rib resting against the truck would probably receive the whole reaction of the chains through either rib, and at the crown the horizontal strain might be borne by one rib only. This arrangement completely eliminates all unequal or undue strains.

RAISING THE BRIDGE, &c.

After the chains are stretched across the river or chasm to be bridged over—the piers having been first erected—they should be fixed in position and temporarily anchored to the ground on either shore by backstays. After the arches and other parts of the bridge are completed, and the chains, arches and chords properly secured to the pin

in the truck upon either pier, these false anchorages could be cut away, and the bridge would be completed.

ADVANTAGES, &c.

The advantages of this bridge would be greatest where the ravine or chasm to be bridged over was of great depth, or where the current of the river was too rapid to admit of inexpensive false works being erected.

This design is a modification and an improvement upon the Royal Albert Bridge, built by Brunel across the Tamar, at Saltash, in Cornwall, England. It is confidently recommended to the attention of engineers. Those who may have the time at their disposal to enter into the calculation of the various strains that can come upon a bridge, will find this design superior to any other. Bridges of long span with parallel chords involve a very great waste of material. This combination of a direct and inverted bowstring girder, will be equally strong with about one half the amount of metal as any of the parallel chord systems of bridges, when the spans are equal.

EDWARD WASELL, C. E.

